

ENVIRONMENTAL ASSESSMENT

Cooperative Gypsy Moth Project For Northern Indiana 2008

By

**Indiana Department of Natural Resources
Division of Entomology & Plant Pathology**

**Indiana Department of Natural Resources
Division of Forestry**

**United States Department of Agriculture
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Table of Contents

1.0	PURPOSE AND NEED FOR ACTION.....	1
1.1	Proposed Action.....	1
1.2	Project Objective.....	1
1.3	Need for Action.....	1
1.4	Decisions to be Made and Responsible Officials	2
1.5	Scope of the Analysis.....	2
1.6	Summary of Public Involvement and Notification	3
1.7	Issues Used to Formulate the Alternatives.....	3
1.8	Other Concerns and Questions.....	4
1.9	Summary of Authorizing Laws and Policies	4
2.0	ALTERNATIVES INCLUDING THE PREFERRED ALTERNATIVE	5
2.1	Process Used to Formulate the Alternatives	5
2.2	Alternatives Eliminated from Detailed Study	5
2.3	Alternatives Considered in Detail	6
2.4	Comparative Summary of Alternatives	8
3.0	AFFECTED ENVIRONMENT	9
3.1	Description of the Proposed Treatment Sites.....	9
3.2	Threatened and Endangered Species	12
3.3	Protection of Historic Properties.....	12
4.0	ENVIRONMENTAL CONSEQUENCES	13
4.1	Human Health and Safety (Issue 1).	13
4.2	Effects on Nontarget Organisms and Environmental Quality (Issue 2).	14
4.3	Economic and Political Impacts of Treatment vs. Non-Treatment (Issue 3).....	16
4.4	Likelihood of Success of the Project (Issue 4).....	17
4.5	Unavoidable Adverse Effects	17
4.6	Irreversible and Irretrievable Commitments of Resources	17
4.7	Cumulative Effects.....	17
4.8	Other Information	18
5.0	LIST OF PREPARERS.....	20
6.0	LIST OF PERSONS AND AGENCIES CONSULTED	22
7.0	REFERENCES CITED.....	23
	APPENDIX A. ISSUES, QUESTIONS AND CONCERNS FROM PUBLIC MEETINGS.....	A-1
	APPENDIX B. MAPS	B-1
	APPENDIX C. AGENCY LETTERS	C-1
	APPENDIX D. EXAMPLE OF PRODUCT LABELS.....	D-1

1.0 PURPOSE AND NEED FOR ACTION

1.1 Proposed Action

The Indiana Department of Natural Resources (IDNR), Division of Entomology & Plant Pathology and Division of Forestry, proposes a cooperative project with the United States Department of Agriculture (USDA), Forest Service (USFS) to treat the gypsy moth populations at 14 sites in 5 counties that cover an estimated 14,313 acres (Table 1). The preferred alternative for the cooperative project is Alternative 5: Btk, mating disruption and/or mass trapping.

Table 1. Number of Treatment Sites and Acres by County and Treatment Method for 2008.

COUNTY	TREATMENT SITES By Treatment Method		TREATMENT ACRES By Treatment Method	
	Mating Disruption	Btk Aerial	Mating Disruption	Btk Aerial
Allen	0	7	0	3605
Elkhart	0	2	0	1051
Lake	1	0	6907	0
LaPorte	0	3	0	2503
St. Joseph	0	1	0	247
Cooperative Project by Treatment	1	13	6907	7406
Total Cooperative Project	14		14,313	

1.2 Project Objective

The objective for this cooperative project is to slow the spread of gypsy moth by eliminating reproducing populations from the proposed treatment sites. Over the past 4 years in Indiana, this objective has been successfully met, while implementing the Slow The Spread Program (STS) [see Tobin & Blackburn (2007) and Gypsy Moth Slow The Spread Foundation, Inc., <http://www.gmsts.org>].

1.3 Need for Action

Gypsy moth is not native to the United States, and it lacks effective natural controls. The caterpillars feed on the foliage of many host plants. Oaks are the preferred host species, but the caterpillars defoliate many species of trees and shrubs when oaks are not available. When high numbers of gypsy moth caterpillars are present, forests and trees suffer severe defoliation, which can result in reduced tree growth, branch dieback and even tree mortality. The high numbers of caterpillars also create a substantial public nuisance and can affect human health.

The State of Indiana, with the IDNR, Division of Entomology and Plant Pathology as the lead agency, is dedicated to preserving urban and rural forested habitats from damage by gypsy moth and to enforcing interstate and intrastate quarantines to further protect areas not currently infested by this pest.

If no action is taken, gypsy moth will increase and spread and defoliation will occur sooner. Therefore, the "no action" alternative is not preferred due to state officials desire to eliminate the isolated infestations, prevent human discomfort associated with infestations, delay damage to local plant communities and reduce spread to adjacent uninfested areas. Local citizens agreed that the "no action" alternative is not preferred through the scoping process (Appendix A).

1.4 Decisions to be Made and Responsible Officials

The preferred alternative in this document proposes cooperative participation of the IDNR and the USFS in treating gypsy moth populations in Indiana. The decision to be made by the responsible USFS official is to choose which of the alternatives presented in this document best fulfills the objectives of the proposed action, and thus the needs of the people of Indiana. In addition, the decision will have to be made as to whether or not any perceived significant environmental impacts could result from the implementation of this project. If there are none, this will be documented in a Decision Notice and FONSI (Finding of No Significant Impact). If significant environmental impacts are found and the project is to continue, an Environmental Impact Statement (EIS) would be prepared.

The alternatives analyzed for this environmental assessment are: 1) No cooperative project (No action), 2) Btk, 3) Mating disruption, 4) Mass trapping, 5) Btk, mating disruption and mass trapping (Preferred Alternative).

The responsible USFS official who will make this decision is:

Michael Prouty, Field Representative, USDA, Forest Service, Northeastern Area, 1992 Folwell Avenue, St. Paul, MN 55108, (651)-649-5276.

The responsible officials for the implementation of the cooperative project in the Indiana IDNR are:

Phil Marshall, State Entomologist, Indiana Department of Natural Resources, Division of Entomology and Plant Pathology, 402 West Washington Street, IGC South, Rooms W290, Indianapolis, IN, 46204, (317) 232-4120.

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1.5 Scope of the Analysis

A final environmental impact statement (FEIS), developed by the USDA, Animal & Plant Health Inspection Service (APHIS) and USFS, entitled Gypsy Moth Management in the United States: a cooperative approach (USDA 1995) was made available in November 1995. The Record of Decision for the FEIS was signed in January of 1996 (USDA 1996), and Alternative 6 was selected, which includes all three management strategies analyzed – suppression, eradication, and slow-the-spread. These strategies depend upon the infestation status of the area: generally infested, uninfested, and transition. Implementation of the FEIS preferred alternative requires that a site-specific environmental analysis be conducted to address local issues before federal or cooperative projects are conducted. This site-specific analysis is tiered to the programmatic environmental impact statement (USDA 1995). As part of the analyses conducted for the FEIS, human health and ecological risk assessments were

prepared (Human Health Risk Assessment, Appendix F to the FEIS and Ecological Risk Assessment, Appendix G to the FEIS). The purpose of tiering is to eliminate repetitive discussions of the issues addressed in the FEIS (40 CFR, 1502.20 and 1508.28 in Council on Environmental Quality, 1992).

This environmental assessment provides a site-specific analysis of the alternatives and environmental impacts of treating gypsy moth populations for the Transition Area in northern Indiana. A separate environmental assessment has been prepared for a gypsy moth eradication project on the Hoosier National Forest and adjacent private lands in Monroe County.

1.6 Summary of Public Involvement and Notification

Public meetings were held during January and February 2008 (Appendix A). Notices were delivered to elected officials, interested groups, residents and local media. At each meeting, state officials presented alternatives for gypsy moth management. The discussion included identification and biology of gypsy moth, pest impacts, survey methods, and control tactics. The proposed actions and alternatives, including no action, were discussed. Local issues, questions and concerns raised at the public meetings are included in Appendix A.

Information gathered at the public meetings and from resource professionals was used to develop issues and concerns related to the project. They are grouped into two categories; 1) issues used to formulate alternatives, and 2) other issues and concerns.

1.7 Issues Used to Formulate the Alternatives

Each of the major issues is introduced in this section. Discussion pertaining directly to each issue as it relates to the alternatives can be found in Chapter 4.

Issue 1 - Human Health and Safety. Three types of risk are addressed under this issue: 1) an aircraft accident during applications, 2) treatment materials and potential effects on people, and 3) the future effects of gypsy moth infestations on people.

Issue 2 - Effects on Nontarget Organisms and Environmental Quality. The major concerns under this issue are: 1) the impact of treatment materials to nontarget organisms, including threatened and endangered species that may be in the treatment sites, and 2) the future impacts of gypsy moth defoliation on the forest resources, water quality, wildlife and other natural resources.

Issue 3 - Economic and Political Impacts of Treatment vs. Non-Treatment. Gypsy moth outbreaks can have significant economic impacts due to effects on the timber resource, nursery and Christmas tree producers, and recreational activities. An additional economic impact is a gypsy moth quarantine imposed to regulate movement of products from the forest, nursery and recreational industries to uninfested areas.

Issue 4 - Likelihood of Success of the Project. The objective of this project is reducing the spread rate of gypsy moth within Indiana. Alternatives vary in their likelihood of success for the current situation in Indiana. Measurement of project success is important for delaying gypsy moth impacts to Indiana and neighboring states.

1.8 Other Concerns and Questions

Concerns and questions were discussed during the public meetings (see Appendix A). Also, other agencies were consulted (see Appendix C). Information from these sources was used to develop management guidelines, treatment constraints, and mitigating measures.

1.9 Summary of Authorizing Laws and Policies

State. The Division Director (State Entomologist) may cooperate with a person in Indiana to locate, check, or eradicate a pest or pathogen (Indiana Code 14-24-2-1). The Division Director may, on the behalf of the department, enter into a cooperative agreement with the United States government, the government of another state, or an agency of the United States or another state to carry out this article (Indiana Code 14-24-2-2). Aerial applicators must meet Indiana Pesticide Use and Application Law (Indiana Code 15-3-3.6) to provide safe, efficient and acceptable applications of pesticides. The Non-Game and Endangered Species Conservation law (Indiana Code 14-22-34) applies to this project.

Federal. Authorization to conduct treatments for gypsy moth infestations is given in the Plant Protection Act of 2000 (7 U.S.C. section 7701 et.seq.).

The Cooperative Forestry Assistance Act of 1978 provides the authority for the USDA and state cooperation in management of forest insects and diseases. The law recognizes that the nation's capacity to produce renewable forest resources is significantly dependent on non-federal forestland. The 2002 Farm Bill (P.L. 107-171d.) reauthorizes the basic charter of the Cooperative Forestry Assistance Act of 1978.

The National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190), 42 USC 4321 et. seq. requires a detailed environmental analysis of any proposed federal action that may affect the human environment. The courts regard federally funded state actions as federal actions.

The Federal Insecticide, Fungicide and Rodenticide Act of 1947, (7 USC 136) as amended, known as FIFRA, requires insecticides used within the United States be registered by the United States Environmental Protection Agency (EPA).

Section 7 of the Endangered Species Act prohibits federal actions from jeopardizing the continued existence of federally listed threatened or endangered species or adversely affecting critical habitat of such species.

Section 106 of the National Historical Preservation Act and 36 CFR Part 800: Protection of Historic Properties requires the State Historic Preservation Officer be consulted regarding the proposed activities.

USDA Departmental Gypsy Moth Policy (USDA 1990) assigns the USFS and APHIS responsibility to assist states in protecting non-federal lands from gypsy moth damage.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Process Used to Formulate the Alternatives

Staff entomologists and administration within the IDNR, Division of Entomology and Plant Pathology and the Division of Forestry in cooperation with USDA Forest Service, formulated several alternatives to treat the gypsy moth populations in Indiana under the slow-the-spread strategies (See Chapter 6, Persons and Agencies Consulted).

The FEIS (USDA 1995), which this document is tiered to, allows the USDA to participate in the Cooperative Gypsy Moth Project for Indiana. The USDA can assist in conducting eradication, slow-the-spread and suppression strategies. The FEIS lists the treatment options for each of the strategies (USDA 1995, Vol. II, p.2-15). For the slow-the-spread strategy, the following six treatment options may be considered: 1) *Bacillus thuringiensis* var. *kurstaki* (Btk), 2) diflubenzuron (Dimilin), 3) nucleopolyhedrosis virus (Gypchek), 4) mass trapping, 5) mating disruption (pheromone flakes), and 6) sterile insect release. These treatment options from the FEIS were used as the alternatives for the site-specific analysis of this Environmental Assessment.

2.2 Alternatives Eliminated from Detailed Study

The following alternatives that are available were eliminated from consideration:

Diflubenzuron (Dimilin). The label for diflubenzuron (Dimilin) prohibits its use over wetlands and directly to water. Most treatment sites contain ponds, lakes, marsh, rivers and/or wetlands. Therefore, its use was not considered for this project. This does not preclude the consideration and use of Dimilin in future projects.

Gypsy moth specific nucleopolyhedrosis virus (Gypchek). Gypsy moth nucleopolyhedrosis virus (Gypchek) has a very limited supply and is targeted for use in special areas that have high environmental concerns (e.g., treatment sites that have threatened or endangered species, which could be impacted by other treatment options). There are limited data on the effectiveness of Gypchek in low-level gypsy moth populations. It is preferably used in suppression projects against moderate to high gypsy moth populations (USDA 1995, Vol. II, p. A7). Therefore, NPV is not considered for this project. In future projects, it will be evaluated for use.

Sterile insect release. The FEIS documents the use of sterile insects for elimination of isolated gypsy moth populations. It also documents the obstacles of using this alternative - the limited release period; need to synchronize production of sterile pupae and release into the population; and the limited availability. This treatment alternative is currently not available, and it has not been used in recent eradication or slow-the-spread treatment projects. Giving consideration to these obstacles, this alternative was not considered for this project. In future projects, it will be evaluated for use.

2.3 Alternatives Considered in Detail

Alternative 1 - No action. If no action is taken, the gypsy moth will reproduce and populations will begin to defoliate trees in the area. Gypsy moth populations will develop and spread to surrounding areas. This is not a preferred alternative because damage and regulatory action will occur sooner than if other alternatives are selected.

Alternative 2 - Btk. This treatment option uses one or two applications of Btk at 24 to 38 billion international units (BIU) per acre applied from air or ground. The applications would begin when leaf expansion is near 50% and when first and second instar caterpillars are present and feeding. This usually occurs between late April and late May in northern Indiana. The second application would follow no sooner than four days after the first application. Most commercial formulations of Btk are aqueous flowable suspension containing 48 or 76 BIU/gal. (Appendix D – example of product label). For aerial application at 24 to 38 BIU, less than 3.0 quarts of the product would be applied per acre.

Btk has been a commonly used treatment option in Cooperative Gypsy Moth Projects in Indiana and other states. Btk is a naturally occurring soil-borne bacterium that is mass-produced and formulated into a commercial insecticide. The Btk strain is effective against caterpillars, including the gypsy moth caterpillar. Caterpillars ingest Btk while eating the foliage. Once in the midgut, Btk becomes active and causes death within a few hours or days (USDA 1995, Vol. II, p. A3-A5). Btk may impact nontarget species of spring-feeding caterpillars in the treatment sites, but the impact to the local population is usually very minimal as Btk rapidly degrades on the foliage within a few weeks, and the nontarget lepidopterans generally re-colonize treatment sites in less than 2 years (USDA 1995, Vol. II, p. 4-52 to 4-55). Human exposure to Btk provides little cause for concern, though direct exposure to the spray may cause temporary eye and respiratory tract irritation in a few people (USDA 1995, Vol. II, p. 4-13).

Btk has proven effective at eliminating gypsy moth at all population levels. Btk applications can meet the project objective of eliminating gypsy moth populations from all of the proposed treatment sites.

Alternative 3 - Mating disruption. This treatment option uses one aerial application of pheromone flakes prior to the emergence of male moths. This would occur in mid-June to early July. Mating disruption relies on the attractive characteristics of the gypsy moth sex pheromone, disparlure. The objective of mating disruption is to saturate the treatment area with enough pheromone sources to confuse the male moths and prevent them from finding and mating with female moths. Mating disruption is considered specific to gypsy moth and is not known to cause impacts to nontarget organism populations, water quality, microclimate, or soil productivity and fertility (USDA 1995, Vol. II, p. 4-67).

Mating disruption involves the aerial application of plastic flake dispensers that are impregnated with the gypsy moth pheromone. The formulation of Disrupt II (see Appendix D – example of product labels) consists of small plastic flakes, approximately 1/32 inch x 3/32 inch (1 x 3 mm) in size, thus the name “pheromone flakes”. A sticker, Monsanto's Gelva 2333, is applied to the flakes as they are dispersed from the aircraft, which aids in the distribution of the flakes throughout all levels in the forest canopy where mating could potentially occur. The flakes are green in color and applied at a rate of 6 or 15 grams active ingredient (disparlure) per acre. At the high rate of 15 grams, 85 grams of flakes are applied in 2 fluid ounces of sticker per acre (2 flakes per sq.ft.) (Thorpe et al. 2006). All of the

ingredients in the Gelva 2333 sticker are considered non-hazardous to public health if used as an additive in the insecticide formulation (40 CFR 180.1001).

Pheromone flakes have proven effective at eliminating gypsy moth at very low population levels. The application of pheromone flakes can meet the project objective of eliminating gypsy moth populations from one of the proposed treatment sites.

Alternative 4 - Mass trapping. This treatment option places gypsy moth traps at a close spacing within the treatment sites. “The objective of this treatment is to capture male gypsy moths before they have a chance to locate and mate with female moths” (USDA 1995, Vol. II, p. A-7). “For mass trapping, delta or milk carton traps are deployed in an intensive grid pattern in an infested area and an adjacent buffer area at the rate of at least 9 traps per acre” (USDA 1995, Vol. II, p. A-8). Thus, it is very labor intensive, especially over large areas. Typically, mass trapping is used on small infestations of less than 40 acres.

Mass trapping has proven capable of eradicating gypsy moth at very low population levels in isolated introductions. The use of mass trapping can meet the project objective of eliminating gypsy moth populations from one of the proposed treatment sites.

Alternative 5 - Btk, mating disruption and mass trapping (Preferred Alternative). The use of this alternative provides flexibility to select Btk, mating disruption, or mass trapping alone or in combination for each site based on the following criteria: 1) gypsy moth population level, 2) habitat type (urban, rural, open water or wetland), 3) nontarget organisms, 4) safety and 5) cost and project efficiency. The use of this alternative can meet the objective of eliminating gypsy moth populations from all of the proposed treatment sites.

2.4 Comparative Summary of Alternatives

Table 2. Summary of Environmental Consequences for Alternatives by Issues from Chapter 4.

	Issue 1 Human Health & Safety (p. 13-14)	Issue 2 Effects on Nontarget Organisms & Environmental Quality (p. 14-16)	Issue 3 Economic and Political Impacts (p. 16)	Issue 4 Likelihood of Success of the Project (p. 17)
Alternative 1 No action	<ul style="list-style-type: none"> - No risk of an aircraft accident or spill. - No risk of Btk contact with humans. - Gypsy moth outbreaks will occur sooner with the associated nuisance and health impacts to humans. 	<ul style="list-style-type: none"> - No direct effect to non target organisms, including threatened and endangered species. - Future gypsy moth impacts will occur sooner, which includes defoliation and reduction in the oak component of forest stands. 	<ul style="list-style-type: none"> - Regulatory action would occur sooner. - Spread of gypsy moth through these counties and into adjacent counties would not be slowed. - Suppression projects and negative financial impacts from defoliation would occur sooner. 	<ul style="list-style-type: none"> - Gypsy moth would not be eliminated from treatment sites and project objective would not be met.
Alternative 2 Btk	<ul style="list-style-type: none"> - Slight risk of aircraft accident and pesticide spill. - Contact with Btk may cause mild and temporary irritation (eye, skin & respiratory) to a few people. - Delay effect of gypsy moth outbreaks on humans. 	<ul style="list-style-type: none"> - Direct impact on spring feeding caterpillars, temporary reduction in local populations. - Unlikely effect on Karner blue butterfly and Mitchell's satyr as neither species occur within or adjacent to treatment sites. - Adverse effect on Indiana bat is unlikely. - Delay the impact of gypsy moth defoliation on environmental quality. 	<ul style="list-style-type: none"> - Regulatory action would not be implemented in these counties during the current year. - Slows the spread of gypsy moth. 	<ul style="list-style-type: none"> - Success is likely in the treatment sites.
Alternative 3 Mating disruption	<ul style="list-style-type: none"> - Slight risk of aircraft accident. - No effect to human health. - Delay effect of gypsy moth outbreaks on humans. 	<ul style="list-style-type: none"> - No effect to nontarget organisms, including threatened and endangered species. - Delay the impact of gypsy moth defoliation on environmental quality. 	<ul style="list-style-type: none"> - Regulatory action would not be implemented in these counties during the current year. - Slows the spread of gypsy moth. 	<ul style="list-style-type: none"> - Success is likely in the treatment sites with very low populations.
Alternative 4 Mass trapping	<ul style="list-style-type: none"> - No risk of aircraft accident or spill. - No risk of Btk contact with humans - No effect to human health - Delay effects of gypsy moth outbreaks on humans. 	<ul style="list-style-type: none"> - No effect to nontarget organisms, including threatened and endangered species. - Delay the impact of gypsy moth defoliation on environmental quality. 	<ul style="list-style-type: none"> - Regulatory action would not be implemented in these counties during the current year. - Slows the spread of gypsy moth. - Cost is prohibitive in large treatment sites. 	<ul style="list-style-type: none"> - Success is likely in small treatment sites with very low populations.
Alternative 5 Btk, Mating disruption and mass trapping	<ul style="list-style-type: none"> - Same as alternative 2, 3 or 4 depending on the treatment at each site. 	<ul style="list-style-type: none"> - Same as alternative 2, 3 or 4 depending on the treatment at each site. 	<ul style="list-style-type: none"> - Regulatory action would not be implemented in these counties during the current year. - Slows the spread of gypsy moth. 	<ul style="list-style-type: none"> - Success is likely in the treatment sites.

3.0 AFFECTED ENVIRONMENT

3.1 Description of the Proposed Treatment Sites

Allen County: There are approximately 432,635 acres in Allen County and 59,276 acres of forest that contain both favorable and unfavorable host species.

Arlington Park: The proposed treatment site contains 1685 acres. The site is composed of trees associated with urban residences and woodlots. Oak, hickory, linden, maple, ash, cherry, crabapple, birch, locust, cottonwood, pine, spruce, and other hardwoods and shrubs are present. Houses, businesses, churches and schools occur within the site. Schools also occur adjacent to the site. There is a golf course in the northeast corner of the site. Mengerson Nature Preserve is located a quarter mile west of the proposed treatment site. Several retention ponds occur within the site. A power line runs through the site. The site was detected in 2007 and has had no prior treatment. Several egg masses were detected in this site in 2007. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

Maplecrest 08: The proposed treatment site contains 776 acres. This site is composed of trees associated with urban residences and woodlots. Oak, maple, beech, ash, sycamore, elm, spruce, pine and other hardwoods and shrubs are present. Houses, schools, businesses, retirement homes, a shopping area and parks occur within the site. A radio tower, cell phone tower and power lines are located within the site. The Maumee River is in the southeast corner of the site. Retention ponds are located in the southwest and northeast corners of the site. The site was detected in 2004 and delimited in 2005, 2006 and 2007. The site was part of a Btk treatment in 2005, part of a mating disruption treatment in 2006 and part of a Btk treatment in 2007. Several egg masses were detected in this site in 2007. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

Memorial Park: The proposed treatment site contains 95 acres. This site is composed of trees associated with urban residences and woodlots. Oak, maple, locust, ash, pine, spruce, hemlock, arborvitae, and other hardwoods and shrubs are present. Houses, businesses and a park occur within the site. There is one school adjacent to the site. The Fort Wayne Water Pollution Control Plant is northeast of the site. There are four radio towers and one smokestack within the site. This site was detected in 2007 and has had no prior treatment. Several egg masses were detected in this site in 2007. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

St. Joe 08: The proposed treatment site contains 247 acres. This site is composed of trees associated with urban residences and woodlots. Oak, maple, hickory, ash, cherry, spruce, pine, and other hardwoods and shrubs are present. Houses, businesses, a church and a school occur within the site. There is a school adjacent to the site. Mengerson Nature Preserves is located south of the proposed treatment site. There are several retention ponds in the southwest corner of the site. There are no known hazards within the site. This site was detected in 1998 and delimited in 1999. The site was part of a Btk treatment in 1999. Several egg masses were detected in this site in 2007. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

Wappes Road: The proposed treatment site contains 122 acres. This site is composed of trees associated with rural residences and woodlots. Oak, maple, hickory, cherry, pine and other hardwoods and shrubs are present. Houses occur within the site. A drainage ditch runs east and west through the center of the site, and two ponds are located adjacent to the eastern edge of the site. The site was detected in 2005 and delimited in 2006. The site was part of a Btk treatment in 2006. Several egg masses were detected in this site in 2007. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

Waterswolde: The proposed treatment site contains 246 acres. This site is composed of trees associated with urban residences and woodlots. Oak, hickory, maple, ash, cherry, pine, spruce, and other hardwoods and shrubs are present. Houses and businesses occur within the site. Schools and a children's play center occur just outside of the site. A ball park is in the southwest part of the site. Power lines and a cell phone tower occur within the site. There are several retention ponds in the northeastern and southwestern corners of the site. The site was detected in 2007 and delimited in 2007. The site was part of a Btk treatment in 2007. Several egg masses were detected in this site in 2007. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

Woodbine: The proposed treatment site contains 434 acres. This site is composed of trees associated with urban residences and woodlots. Oak, hickory, maple, cherry, beech, ash, cottonwood, pine, spruce, and other hardwoods and shrubs are present. Houses and businesses occur within the site. Smith Field Airport is adjacent to the southeast corner of the site. There is one school just outside of the site. Two retention ponds occur in the northeast corner of the site as well as headwaters of Spy Run Creek in the southern edge of the block. An environmentally sensitive area is adjacent to the eastern edge of the site. Several power lines and two radio towers are present in the site. The site was detected in 2006 and delimited in 2007. The site was part of a Btk treatment in 2007. Several egg masses were detected in this site in 2007. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

Elkhart County: There are approximately 303,274 acres in Elkhart County and 39,016 acres of forest that contain both favorable and unfavorable host species.

County Road 30: The proposed treatment site contains 856 acres. This site is composed of trees associated with rural residences and woodlots. Oak, maple, cottonwood, locust, willow, ash, and other hardwoods and shrubs are present. Houses occur within the site, and a ball park is located in the southwest corner of the site. A large tower (Elkhart 911 Call Center) is just north of the site. A water tower and cell tower are just east of the site. Power lines occur in the southern part of the site. Several retention ponds occur within the site. Leedy Ditch runs north/south through the east part of the site. The site was detected in 2006 and delimited in 2007. The site was part of a Dimilin ground treatment site in 2007. Egg masses were detected in this site in 2007. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

Goshen: The proposed treatment site contains 195 acres. This site is composed of trees associated with urban residences and woodlots. Oak and some pine, spruce and maple and other

hardwoods and shrubs are present. Houses occur within the site. A flooded stone quarry and several retention ponds occur adjacent to the site. A radio antenna is adjacent to the west side of the site. The site was detected in 1998 and delimited in 1999 and 2007. This site was part of a Btk treatment site in 1999 and 2007. Egg masses were detected in this site in 2007. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

Lake County: There are approximately 316,431 acres in Lake County and 18,877 acres of forest that contain both favorable and unfavorable host species.

Oak Ridge: The proposed treatment site contains 6907 acres. This site is composed of trees associated with urban residences and woodlots. Oak and maple and other hardwoods and shrubs are present. Houses, schools and churches occur within the site. Oak Ridge Prairie County Park is located within the proposed treatment site. Hoosier Prairie Nature Preserve is located just west of the proposed treatment site. Several small ponds and lakes occur within the site. Nine towers are present within the site. The site was detected in 2007 and has had no prior treatment. No egg masses were detected in this site in 2007. Survey indicates a very low gypsy moth population, and mating disruption flakes are proposed for this site.

LaPorte County: There are approximately 401,015 acres in LaPorte County and 45,618 acres of forest that contain both favorable and unfavorable host species.

Beatty Corner: The proposed treatment site contains 170 acres. This site is composed of trees associated with rural residences and woodlots. Oak, maple and other hardwoods and shrubs are present. Houses occur within the site. Little Calumet Headwaters Nature Preserve is located approximately one mile southeast of the proposed treatment site. No hazards occur within the site. The site was detected in 2007 and has had no prior treatment. Egg masses were detected in this site in 2007. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

Lofgren: The proposed treatment site contains 2179 acres. This site is composed of trees associated with rural residences and woodlots. Oak and maple and other hardwoods and shrubs are present. Houses and a church occur within the site. No hazards occur within the site. The site was detected in 2006 and delimited in 2007. This site was part of a Dimilin ground treatment in 2007. Egg masses were detected in this site in 2007. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

Springville 08: The proposed treatment site contains 154 acres. This site is composed of trees associated with rural residences and woodlots. Oak and maple and other hardwoods and shrubs are present. Houses and a church occur within the site. No hazards occur within the site. Springville Fen Nature Preserve is approximately a half mile east of the proposed treatment site. The site was detected in 2003 and delimited in 2004 and 2006. The site was part of a Btk treatment site in 2004 and 2006. Egg masses were detected in this site in 2007. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

St. Joseph County: There are approximately 283,449 acres in St. Joseph County and 36,467 acres of forest that contain both favorable and unfavorable host species.

Quince Road: The proposed treatment site contains 247 acres. This site is composed of trees associated with rural residences and woodlots. Oak, maple, ash, pine, spruce and other hardwoods and shrubs are present. Houses and a conservation club area occur within the site. Schools, a horseback riding center and another conservation club are just adjacent to the site. There is a cell tower within the site and water inlets of South Chain Lake within the site. The site borders North and South Chain Lake on the east. There is a natural wet prairie habitat located east and across the lake from the proposed treatment site. The site was detected in 2007 and has had no prior treatment. Egg masses were detected in this site in 2007. Survey indicates a low gypsy moth population, and Btk is proposed for this site.

3.2 Threatened and Endangered Species

Consultation with the staff of the U.S. Fish and Wildlife Service determined that one of the proposed treatment methods, spraying with *Bacillus thuringiensis* (Bt), is of concern for 2 federally endangered species of Lepidoptera in Indiana, the Karner blue butterfly (*Lycaeides melissa samuelis*) and Mitchell's satyr butterfly (*Neonympha mitchelii*). "The known occurrences of these 2 endangered species are in the northern portions of Lake and Porter Counties (Karner blue butterfly), and isolated locations in LaPorte and LaGrange Counties (Mitchell's satyr)." "Neither species is known to occur near any of the Btk sites identified in your letter. Treatment with Disrupt II pheromone flakes, which is considered to be highly specific for gypsy moths, will have no adverse impacts on the federally listed butterflies." (Appendix C – U.S. Fish & Wildlife Letter).

The proposed treatment sites are within the range of the federally endangered Indiana bat (*Myotis sodalis*). None of the proposed treatment sites are near Indiana bat hibernacula. All of the 2008 Btk aerial treatment sites are limited to relatively small areas of Indiana bat summer habitat. Therefore the FWS concludes, "that the federally assisted 2008 gypsy moth program is not likely to adversely affect any of these federally listed species." (Appendix C – U.S. Fish & Wildlife Letter).

The IDNR, Environmental Unit reviewed the project and determined, "At this time, no harm to state or federal listed species resulting from the proposed control measures is known or anticipated. The potential harm from the project is less than the potential harm to these same species from an uncontrolled gypsy moth infestation." (Appendix C – IDNR, Early Coordination/Environmental Assessment).

3.3 Protection of Historic Properties

The State Historic Preservation Officer did not identify any historic properties that will be altered, demolished, or removed by the proposed project pursuant to Indiana Code 14-21-1-18. (Appendix C – IDNR Letter Division of Historic Preservation and Archaeology).

4.0 ENVIRONMENTAL CONSEQUENCES

This section is the scientific and analytic basis for the comparison of alternatives. It describes the probable consequences (effects) of each alternative for each issue. Environmental consequences are summarized in Table 2 for each combination of the alternatives and issues.

4.1 Human Health and Safety (Issue 1).

Alternative 1 – No action. For this alternative, there would be no cooperative project, therefore risk of human contact with pheromone flakes or Btk and an aircraft accident during application would not exist. However, future impacts by gypsy moth to human health will occur sooner under Alternative 1 than if treatments are used to slow-the-spread of these gypsy moth populations. Gypsy moth outbreaks have been associated with adverse human health effects, including skin lesions, eye irritation, and respiratory reactions. Gypsy moth caterpillars can become a serious nuisance that can cause psychological stress in some individuals (USDA 1995, Vol. II, p. 4-9).

Alternative 2 - Btk. Human exposure to Btk provides little cause for concern about health effects. “On the basis of both the available epidemiology studies as well as the long history of use, no hazard has been identified for members of the general public exposed to Btk formulations” (USDA 1995, Vol. III, p. 4-15). Exposure to Btk may result in temporary eye, skin, and respiratory tract irritation in a few people. A detailed analysis of the risks posed to humans by Btk was conducted for the FEIS -- Human Health Risk Assessment (USDA 1995, Vol. III). Glare and O’Callaghan provide a comprehensive review of *Bacillus thuringiensis*, including Btk. They conclude with this statement, “After covering this vast amount of literature, our view is a qualified verdict of safe to use.” (Glare and O’Callaghan, 2000)

A slight risk of an accident always exists when conducting aerial applications – Btk uses two applications. To further reduce this risk, a detailed work and safety plan is required prior to program implementation, which outlines guidelines for aircraft inspections, Btk loading, and conditions for safe applications.

The effect of gypsy moth outbreaks on humans would be delayed using this alternative.

Alternative 3 – Mating disruption. The toxicity of insect pheromones to mammals is relatively low and their activity is target-specific. Therefore the EPA requires less rigorous testing of these products than of conventional insecticides. Risk to human health due to exposure to disparlure, the active ingredient in pheromone flakes, is discussed in the FEIS (USDA 1995, Vol. II, pp. 4-30 to 4-32). Once absorbed through direct contact, disparlure is very persistent in humans, and individuals exposed to disparlure may attract adult male moths for prolonged periods of time. This persistence is viewed as a nuisance and not a health risk (USDA 1995, Vol. III, 8-1). In acute toxicity tests, disparlure was not toxic to mammals, birds, or fish (USDA 1995, Vol. IV, 5-5) therefore no effects to human health are anticipated.

A slight risk of an accident always exists when conducting aerial applications – mating disruption uses one application. To further reduce this risk, a detailed work and safety plan is required prior to program implementation, which outlines guidelines for aircraft inspections, pheromone flake loading, and conditions for safe applications.

The effect of gypsy moth outbreaks on humans would be delayed using this alternative.

Alternative 4 – Mass trapping. The effect of gypsy moth outbreaks on humans would be delayed using this alternative. The human health effects are not anticipated from the use of disparlure in the delta traps (see Alternative 3 above).

Alternative 5 – Btk, mating disruption, and mass trapping. The human health and safety consequences stated above for Alternatives 2, 3 and 4 apply to this alternative.

4.2 Effects on Nontarget Organisms and Environmental Quality (Issue 2).

Alternative 1 – No action. With no treatments in the current year, future impacts by the gypsy moth would occur sooner. Defoliation by the gypsy moth will cause selective mortality of preferred host trees. During outbreaks, forest ecosystems can change due to a reduction of the oak component and an increase of tree species that are less desired by gypsy moth, such as maple and ash. Oak forests would likely consist of a more mixed composition in the future; though oak would still be a component.

Gypsy moth defoliation and subsequent tree mortality can affect nontarget organisms by dramatically changing habitats on a local scale. Heavy defoliation can remove food for other leaf-feeding species, including other caterpillars. However, it can also create new habitat for some species by creating snags and increasing understory plant development by increasing light penetration into defoliated areas. Impacts on a larger scale (national, regional, or state) are subtle, gradual, and may be noticeable only after many years or decades (USDA 1995, Vol. II, p. 4-74). Short- and long-term changes in nontarget species have been shown for moderate and heavy defoliation (USDA 1995, Vol. II, p. 4-47 and 4-50). An Ecological Risk Assessment (USDA 1995, Vol. IV) examined gypsy moth impacts on a wide variety of species (mammals, birds, reptiles, amphibians, fish, insects, mollusks, crustaceans, and other invertebrates). Further discussion of gypsy moth and its impact on forest conditions can be found in the FEIS (USDA 1995, Vol. II, p. 4-41 and 4-74).

Alternative 2 - Btk. Btk can have direct and indirect effects on nontarget organisms. Direct toxicity of Btk is generally limited to the larval stage of moth and butterfly species. Btk is not toxic to vertebrates, honeybees, parasitic and predatory insects, and most aquatic invertebrates (USDA 1995, Vol. IV, p. 5-1). Btk has a direct adverse effect on caterpillars of moths and butterflies, but susceptibility varies widely among species. Btk, as used in gypsy moth projects, poses a risk to some spring-feeding caterpillars; however, permanent changes in their populations do not appear likely. An exception may occur in certain habitats that support small isolated populations of a particular species of moth or butterfly that is highly susceptible to Btk (USDA 1995, Vol. II, p. 4-54). The U.S. Fish and Wildlife Service identified two federally endangered butterflies - Karner blue butterfly (*Lycaeides melissa samuelis*) and the Mitchell's satyr butterfly (*Neonympha mitchellii*). These species are not known to occur within or near to the sites proposed for treatment using Btk. (Appendix C - U.S. Fish & Wildlife Letter).

Btk may have an indirect effect on other organisms by a reduction in their food resource (e.g. caterpillars, pupae, or adult moths and butterflies). Any effects on vertebrates due to reduction in food availability are probably subtle, especially for mammals and birds that are very mobile. Populations of some gypsy moth parasites and some general lepidopteran parasites may be reduced, due to the

reduction in number of potential hosts caused by the Btk spray (USDA 1995, Vol. IV, p. 5-7). The U.S. Fish and Wildlife letter identified that the treatment sites are within the range of the federally endangered Indiana bat (*Myotis sodalis*). None of the proposed treatment sites are near Indiana bat hibernacula. All of the 2008 Btk aerial treatment sites are limited to relatively small areas of Indiana bat summer habitat. Therefore the FWS concludes “that the federally assisted 2008 gypsy moth program is not likely to adversely affect any of these federally listed species.”(Appendix C – U.S. Fish & Wildlife Letter).

Applications of Btk formulations do not increase levels of Btk in soil, and Btk persists for a relatively short time in the environment. Changes in soil productivity and fertility are not likely in the treatment sites, because Btk occurs naturally in soils worldwide. Additional information concerning the effects to soil can be found in Appendix G of the FEIS (USDA 1995, Vol. IV).

Application of Btk is likely to maintain the forest condition in the short-term by eliminating gypsy moth populations in the treatment sites, thus delaying gypsy moth from expanding and causing defoliation. In the long-term, gypsy moth will become well established in these counties; even if this alternative is implemented.

Alternative 3 – Mating disruption. The pheromone in the flake dispenser is specific to gypsy moth, and it will not affect other insects, including any threatened and endangered species of butterflies or moths.

A quantitative assessment of risk from mating disruption was not conducted for the FEIS because of disparlure’s low toxicity to vertebrates and specificity to gypsy moth. As used in mating disruption, disparlure is not likely to impact nontarget organisms (USDA 1995, Vol. II, p. 4-67). The toxicity of insect pheromones to mammals is relatively low. In acute toxicity tests, disparlure was not toxic to mammals, birds, or fish (USDA 1995, Vol. IV, 5-5). At normal application rates, concentration of the pheromone (disparlure) impregnated in the flakes remains active for one season only. Therefore, no effects on nontarget organisms are anticipated from the proposed pheromone flake application.

Most ingredients in the flakes are insoluble in water, so the risk of disparlure leaching into groundwater is minimal. To determine the amount of disparlure that could potentially leach into water, 50 grams of flakes were submerged in 150 ml of water and vigorously agitated for 24 hours. Results indicate that less than 0.04% of the active ingredient (disparlure) contained in the flakes leached into water under these conditions. Disrupt II (product name for the pheromone flakes) is applied at doses of 6 or 15 grams of active ingredient (disparlure) per acre and 90% of the flakes are intercepted by and adhere to the forest canopy, where they remain until they have released most of the disparlure.

Using pheromone flakes to disrupt mating is likely to maintain the forest condition in the short-term by eliminating gypsy moth populations in the treatment sites, thus delaying gypsy moth from expanding and causing defoliation. In the long-term, gypsy moth will become well established in these counties; even if this alternative is implemented.

Alternative 4 - Mass trapping. The pheromone in the delta trap is specific to gypsy moth and will not have an effect on other insects or threatened and endangered species of butterflies or moths. “Mass

trapping does not affect nontarget organisms, except those (primarily flying insects) that accidentally find their way into the trap.” (USDA 1995, Vol. II, p. A-9).

Mass trapping is likely to maintain the forest condition in the short-term by eliminating gypsy moth populations in the treatment sites, thus delaying gypsy moth from expanding and causing defoliation. In the long-term, gypsy moth will become well established in these counties; even if this alternative is implemented.

Alternative 5 - Btk, mating disruption, and mass trapping. The nontarget and environmental consequences stated above for Alternatives 2, 3 and 4 apply to this alternative.

4.3 Economic and Political Impacts of Treatment vs. Non-Treatment (Issue 3).

Alternative 1 – No action. If no treatments were applied, the likely action would be to implement a quarantine in these counties during the next year. A quarantine would regulate movement of firewood, logs, other timber products, mobile homes, recreational vehicles, trees, shrubs, Christmas trees, and outdoor household articles. This would create a financial impact to industries that deal with these products.

If current populations are not treated, they will continue to reproduce and grow in size. Defoliation would become noticeable in the future, but it would be difficult to predict exactly when noticeable defoliation would occur. Requests for federal assistance to suppress gypsy moth would be likely when defoliation occurs. Suppression projects are generally more expensive in total dollars than eradication projects because much larger areas are treated. The economic impact to state budgets would increase, as responsible agencies would need to administer and fund these suppression projects.

Following defoliation, negative financial impacts are likely to occur for recreational industries such as resorts and campgrounds. Homeowners, private woodland owners, and forest-based industries could be impacted by gypsy moth treatment costs, tree mortality, and adverse human health effects.

Alternative 4 – Mass trapping. If treatments are applied, regulatory action is not likely for these counties during the next year and the impacts listed under Alternative 1 would be delayed. Mass trapping is typically used in small areas (less than 40 acres) because it is labor intensive (USDA 1995, Vol. II, p. A8-9). Its use for all treatment sites would be cost prohibitive.

Alternatives 2 (Btk), 3 (Mating disruption) and 5 (Btk, mating disruption, and mass trapping). If treatments are applied, regulatory action is not likely for these counties during the next year and the impacts listed under Alternative 1 would be delayed.

Economic analysis from the Slow-The-Spread Program (STS) demonstrated the use of Btk, mating disruption and other STS technology reduced the spread of gypsy moth by as much as 60 percent (Sharov et al. 2002, p. 32). The Eastern Plant Board recognized that the benefit of delaying gypsy moth resulted in an economic benefit of \$22.00 for each dollar invested in treatment cost and that the STS Program protected timber, recreation, and private property values (Eastern Plant Board 1997).

4.4 Likelihood of Success of the Project (Issue 4).

Alternative 1 – No action. Project objectives would not be met with this alternative. Gypsy moth would not be eliminated from the treatment sites, and its population would serve as a source for increased spread within the counties and into surrounding counties. If these populations were allowed to increase and expand, gypsy moth could spread through the state in 10 years (Sharov et al. 2002).

Alternative 2 - Btk. Project success is likely with this alternative. Btk is effective in eliminating gypsy moth in the treatment sites with low gypsy moth populations.

Alternative 3 – Mating disruption. Project success is likely with this alternative in one site. However, most sites have gypsy moth populations above the recommended level for treatment with mating disruption.

Alternative 4 – Mass trapping. Mass trapping is a labor-intensive treatment and sites greater than 40 acres are usually not mass trapped. It would not be feasible to mass trap all treatment sites.

Alternative 5 - Btk, mating disruption, and mass trapping. Project success is optimized with this alternative when treatment selection criteria are used to determine the use of Btk, mating disruption or mass trapping alone or in combination for each site. Over the past 4 years, the leading edge of gypsy moth populations (as defined by the 10-moth line) has not advanced in Indiana while implementing the Slow The Spread Program (STS). From the data analysis by the STS Program, the average rate of spread in Indiana during 2004-2007 was calculated to be 1.2 miles per year. Treatment selection criteria used to evaluate each site are: 1) gypsy moth population level, 2) habitat type (urban, rural, open water or wetland), 3) nontarget organisms, 4) safety, and 5) cost and project efficiency.

4.5 Unavoidable Adverse Effects

No unavoidable adverse effects were identified for the proposed project.

4.6 Irreversible and Irretrievable Commitments of Resources

An irreversible commitment of resources results in the permanent loss of: 1) nonrenewable resources, such as minerals or cultural resources; 2) resources that are renewable only over long periods of time, such as soil productivity; or 3) a species (extinction) (USDA 1995, Vol. II, p. 4-93). Except for Alternative 1, there is an irreversible commitment of labor, fossil fuel, and money spent on the project.

An irretrievable commitment is one in which a resource product or use is lost for a period of time while managing for another (USDA 1995, Vol. II, p. 4-93). For this project, no irretrievable commitments were identified.

4.7 Cumulative Effects

No cumulative effects were identified for this proposed project. Cumulative effects are the incremental impacts of the action when added to past, present, and reasonably foreseeable future actions, which are

collectively significant. Six sites proposed for treatment in 2008 had treatments in the past five years (See Table 3).

Table 3. Summary of Treatment History of 2008 Proposed Treatment Sites by Year and Treatment Method*.

County	2008 Site Name	Site Treatment History **					2008 Proposed Treatment
		2003	2004	2005	2006	2007	
Allen	Arlington Park						Btk
Allen	Maplecrest 08				MD	Btk	Btk
Allen	Memorial Park						Btk
Allen	St. Joe 08						Btk
Allen	Wappes Road				Btk		Btk
Allen	Waterswolde					Btk	Btk
Allen	Woodbine					Btk	Btk
Elkhart	County Road 30						Btk
Elkhart	Goshen					Btk	Btk
Lake	Oak Ridge						MD
LaPorte	Beatty Corner						Btk
LaPorte	Lofgren						Btk
LaPorte	Springville 08		Btk		Btk		Btk
St. Joseph	Quince Road						Btk

* Treatment method: Btk = *Bacillus thuringiensis* var. *kurstaki*

MD = Mating disruption using pheromone flakes

** Indicates previous treatments where there was partial overlap with the 2008 proposed treatment site.

Cumulative effects from Btk applications over several years are not anticipated because the treatment sites are generally less than 1000 acres and similar habitats are nearby that have not been treated; thus treatment sites are likely to be recolonized rapidly (USDA, 1995, Vol. II, p. 4-89 to 4-91). No gypsy moth treatments by the private sector are expected in the proposed treatment counties during the current year. No cumulative effects of the prior treatments are anticipated.

4.8 Other Information

Mitigation

The Cooperative Gypsy Moth Project will implement the following safeguards and mitigating measures:

- News releases of treatments and dates will be given to local newspapers and radio/TV stations.
- Local safety authority will be notified by direct contact or phone calls.
- Employees of state and federal agencies monitoring the treatment will receive training on treatment methods to be able to answer questions from the public.
- Application of Btk will be suspended when school buses are in the site and when children are outside on school grounds.
- Aircraft will be calibrated for accurate application of treatment material.
- Applications will be timed so the most susceptible gypsy moth stage is targeted.
- Weather will be monitored during treatment to assure accurate deposition of the treatment material.

The Indiana Department of Natural Resources identified four nature preserves and a natural wet prairie habitat either just outside or adjacent to five of the proposed Btk sites. The aerial applicator will be informed of the locations of the nature preserves. The wind speeds during the application will be monitored by IDNR personnel and the aerial applicator will maintain the application within the boundaries of the proposed treatment site. Treatment will be avoided or stopped if winds are above the guidelines stated in the Work and Safety Plan.

Monitoring

During the treatments, ground observers and/or aerial observers will monitor the application for accuracy within the site boundaries, swath width, and drift. Application information (e.g. swath widths, spray-on and spray-off, acres treated, and altitude) will be downloaded to an operations-base computer.

The Btk and mating disruption treatment sites will be monitored using gypsy moth traps to determine the effectiveness of the treatments.

5.0 LIST OF PREPARERS

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James Glass, Director, IDNR Division of Historic Preservation and Archaeology, 402 West Washington Street, Room W274, Indianapolis, IN 46204. Consultation on historical properties of concern.

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Scott Pruitt, Field Supervisor, US Fish and Wildlife Service, 718 North Washington Street, Bloomington, IN 47404. Consultation on threatened and endangered species.

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Christie Stanifer, Environmental Coordinator, Environmental Unit, IDNR Division of Fish and Wildlife, 402 West Washington Street, Room 264W, Indianapolis, IN 46204. Consultation on treatment site and proposed project.

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